

GASTROPODA
FROM THE ABATTOIRS BORE, ADELAIDE, SOUTH AUSTRALIA
TOGETHER WITH
A LIST OF SOME MISCELLANEOUS FOSSILS FROM THE BORE

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[Read 8 May 1941]

PLATES IV AND V

INTRODUCTION

The Abattoirs Bore has been an object of interest since its very rich fossiliferous material was collected in 1919 by the late Sir Joseph Verco and the late Professor Howchin. The present paper deals with the remaining groups to be considered in completing the list of species from the Bore represented in the Tate Collection. The writer is entirely dependent upon information given in conversation with Sir Joseph Verco relating to the manner of collecting and the depths from which the material was obtained. Notes by Verco, in my possession, are of conchological interest only; as the fossil species were unfamiliar to him, remarks were made on the outstanding features of shells, many of which were already described by Tate and other workers on Tertiary fossils from Victoria, Tasmania and South Australia.

The writer has always felt that the information available to her was unsatisfactory from a stratigraphical viewpoint; Verco stated that a dray-load of fossiliferous sand, from depths of 400-500 feet, heaped beside the Bore, had been collected and the mollusca sorted out by him. A preliminary glance at the numerous species revealed that some, hitherto considered as restricted to the Barwonian in Victoria, appeared with a predominantly Pliocene assemblage. It seemed likely that the boring had penetrated more than one horizon, and an admixture of faunas resulted from an indiscriminate dumping of the material before it could be collected by someone interested primarily in stratigraphy. After listing the Pelecypoda and describing new species (34), the writer deferred work on the Gastropoda until more reliable data could be used as a basis.

Howchin and Parr (20) have since published details of the Foraminifera from the Bore, together with the driller's log, indicating that several horizons had been penetrated before the boring stopped at 820 feet. This would appear to support the writer's earlier conclusion that, as a contribution to stratigraphy, the mollusca were so confused as to be of relatively little value. More recently, through the courtesy of the South Australian Mines Department, the writer has been able to examine material from several other borings near Adelaide, all collected carefully from various depths. While none of them is as rich in the number of species as the Abattoirs, sufficient indication has been given that the Abattoirs Bore mollusca, with a few possible exceptions, represent a single stage. It is likely that they came from depths of about 360 feet to 500 feet, the "grey sand" horizon, and that the yellow underlying Miocene (20) is not represented in the mollusca. Homogeneity in the state of preservation and colour, however, is an insufficient and misleading indicator of a single stage, and in the deposits underlying the Adelaide Plains cannot be considered as such.

AGE OF THE MATERIAL

Difficulty is generally experienced in correlating Tertiary horizons in Southern Australia. Some workers have found it difficult to agree on the relative positions of numerous isolated beds, and others have, as the occasion

demanded, changed their opinions as a result of increasing knowledge of the geographical and stratigraphical range of species; it is partly due to the consideration of some zoological groups to the exclusion of others, particularly with the foraminifera and mollusca. It should be possible, as Finlay and Marwick have found in New Zealand (14), to take both the macro- and micro-faunas into consideration and eliminate apparent inconsistencies.

The "grey sand" horizon under consideration here is the "Adelaidean" (Pliocene), appearing in many borings near Adelaide at somewhere near the 350-foot level. The relative position of these beds has always seemed doubtful, mainly because only the larger and more common species were identified. At first glance, a close relationship to the Kalimnan of Eastern Victoria seems obvious. The writer (21) has expressed the view that both the Kalimnan and Adelaidean stages are Lower Pliocene in age; Hall and Pritchard (16) and Chapman (1, 4) have identified the Adelaidean with the Kalimnan, though in a recent note (20) the latter has stated that its "position in the vertical scale appears to be better indicated by the comprehensive series of the foraminifera," and he agrees with Howchin that the beds are younger than Kalimnan (though not stating, as Howchin does (18, 19, 20) that they are Upper Pliocene). In an earlier paper (9) Cotton and the writer followed Howchin and referred Abattoirs Bore species of *Turritella* to the Upper Pliocene; these belong to the Adelaidean stage. Singleton classifies the Adelaidean as (?) Middle Pliocene (25).⁽¹⁾

The evidence of the foraminifera cannot be overlooked, but it is doubtful whether, from early Pliocene upwards, they alone can be conclusive. Finlay and Marwick (14) have found that New Zealand Pliocene stages are indicated principally by the mollusca, and the same has been the case hitherto in Australia. With the Adelaidean stage, to the fauna of which the Abattoirs Bore makes the largest contribution, useful results are obtainable by considering the foraminifera and mollusca along parallel lines. Parr (24) has made an interesting analysis of the Kalimnan and Adelaidean foraminifera, which, from the point of view of the age of the Adelaidean, could be strengthened by comparison with the micro-faunas of Pliocene localities nearer geographically to the Adelaidean.

From an analysis of the mollusca and the evidence of the foraminifera, the writer considers the Adelaidean a slightly younger stage than the Kalimnan. To adjust the Adelaidean, Werrikooian and Kalimnan to the European time-scale is not easy; if the Kalimnan is accepted as Lower Pliocene and the Werrikooian as Upper Pliocene, to place the Adelaidean without qualification in Middle Pliocene is to convey the impression that the Adelaidean provides a single link between the Kalimnan and the Werrikooian. This is far from being the case, many of the Adelaidean mollusca being restricted Kalimnan species and very few Werrikooian species are found. Since the Adelaidean beds are thicker than those of the type Kalimnan area, careful investigation of further borings may show that the Adelaidean represents a longer time range than the Kalimnan and should be classified as Lower-Middle Pliocene.

CONDITIONS OF DEPOSIT

The unusual richness, specifically and numerically, of narrow, highly fossiliferous beds of the Adelaidean stage invites comparison with thick shelly deposits on certain beaches today. Mr. B. C. Cotton states that under South Australian conditions, shells are deposited at the north-eastern part of a beach, preferably in a sheltered bay or estuary. The Abattoirs and other richly fossiliferous bores in the Adelaidean show similar conditions of deposit to those of the Outer Harbour at the present day. The maximum thickness is about 200 feet, laid down

⁽¹⁾ Dr. Singleton's recent publication, "The Tertiary Geology of Australia," Proc. Roy. Soc. Vict., 53, (1), (n.s.), 1941, came to hand after the present paper had been submitted for publication.

under conditions of depression contemporaneous with early stages of the step-faulting from the Mount Lofty Ranges to St. Vincent Gulf. The gastropod genera represented indicate much warmer climatic conditions than those of the present day or of the Werrikoonian, and many new species exhibit close relationships, both generically and specifically, with Recent shells of tropical Queensland to which they are possibly ancestral.

ANALYSIS OF THE GASTROPOD FAUNA

Of the 200 gastropod species, 67 occur in the Kalimnan of Victoria, either in the Gippsland Lakes area or at localities accepted as contemporaneous with the type; 16 are known previously only in the Barwonian; three are restricted to South Australian Lower Pliocene horizons; five are found elsewhere only among the "Murray Desert" (33) fossils (possibly exactly contemporaneous with the Adelaidean); 44 are peculiar to the horizon and 22 are identical with or close to Recent species not occurring in the Kalimnan; the rest are of doubtful limits (such as *Baryspira pseudaustralis* which occurs in the Barwonian, in the "Murray Desert" fossils and in the Adelaidean), or are indeterminate specifically. Of the species in common with the Kalimnan, about 22 appear to be restricted. The Adelaidean apparently has about 10% more of its gastropod species living than has the Kalimnan. This cannot be taken as a significant percentage in view of the limited geographical distribution of some of the species in question and the likelihood of many of them proving distinct as more material becomes available for comparison.

MISCELLANEOUS FAUNA

Various oddments collected with the mollusca have been listed, though the bryozoa appear to have been completely overlooked, and no information is available. Other phyla represented are consistent with species from the Kalimnan.

NOMENCLATURE

It is felt that some explanation is needed of obvious inconsistencies in the use of generic names. This list provides a working basis for comparing the fauna of the Adelaidean with those of other horizons. As far as is possible, names in present use have been employed, Cotton (8) being followed for Recent shells. Considerable difficulty arises with the fossil species. Australian workers generally have been conservative and little revision of genera has been done. To alter some generic names without investigating the group as a whole is undesirable. From a palaeontological viewpoint, the genus and subgenus method used with the Turritellidae is the most satisfactory, being intelligible to the geologist and sufficiently accurate for the specialist, and is consistent with modern trends in systematics (35).

ACKNOWLEDGMENTS

The writer wishes to express indebtedness to Mr. T. Iredale, of the Australian Museum; Mr. B. C. Cotton, of the South Australian Museum; Sir Douglas Mawson, Dr. C. T. Madigan, Miss I. Crespin, Mr. F. A. Singleton, and particularly to Miss Joyce Allan of the Australian Museum, for her excellent illustrations.

DESCRIPTION OF NEW SPECIES AND REMARKS ON NOTEWORTHY SPECIES

Holotypes of all new species are lodged in the Tate Collection, Adelaide University; the type locality of all new species is the Abattoirs Bore, Adelaide, South Australia; the geological horizon is Adelaidean, Pliocene, in each case.

Class **GASTROPODA**
 Subclass **STREPTONEURA**
 Ord. **ASPIDOBANCHIA**
 Subord. **ARCHAEOGASTROPODA**
 Superfam. **ZEUGOBRANCHIA**
 Fam. **FISSURELLIDAE**
 Genus **TUGALI** Gray 1843
Tugali infortunatum sp. nov.

(Pl. iv, fig. 1)

Shell thin, small, oblong, low. Apex small but prominent, strongly recurved, situated at about one-quarter from the posterior margin. Shell flatly convex anteriorly, slightly concave below the apex and flattening towards the posterior margin. Sculpture of about 40 primary radiating ribs with fainter secondary ribs rising irregularly between them. Numerous concentric ribs, closer and less prominent than the radials, the radials over-riding the concentrics so that there is no conspicuous granulation. Margin flattened, finely crenulate. Anterior margin sinuate, sinus produced into a faint canal within, corresponding to a thickened anterior rib on the exterior. Length, 4.2 mm.; breadth, 2.5 mm.; height, 1.0 mm.

This distinct species presents one or two unsatisfactory aspects. There are two specimens from the Bore, a larger with the margin completely broken and a smaller which is perfect but obviously immature. The younger is taken as the holotype. The only difference exhibited by the older shell is that the thickened rib from the apex to the anterior border in the juvenile extends only about half-way in the older shell, developing into three normal, radiating ribs with the regular concentrics as in the rest of the shell.

Subord. **RHIPIDOGLOSSA**
 Superfam. **TROCHACEA**
 Fam. **TROCHIDAE**
 Genus **CLANCULUS** Montfort 1810
Clanculus quadringulatus sp. nov.

(Pl. iv, fig. 2)

Shell solid, depressed conoidal, falsely umbilicate. Protoconch of one-and-a-half small turns, apex smooth, gradually developing four pronounced lirae; adult whorls four, sculptured with rows of granulose cinguli, four on the penultimate whorl, 13 extending from the suture to the umbilical fissure on the body whorl, the nine on the base being finer, somewhat more closely granulose and more closely situated than the four above the periphery. The granulation of the cinguli develops with the number of the whorls; part of the protoconch and the first adult whorl show smooth cinguli, the second whorl a very fine granulation which becomes increasingly coarser on the third and fourth whorls. Interstices finely axially lirate. Whorls slightly convex, suture depressed, periphery rounded. Aperture oblique, tetragonal; outer lip thick, abruptly lirate within; columella oblique, edge reflexed with one median tubercle and a prominent bifid tooth at the lower edge; umbilical depression relatively deep and narrow, strongly dentate. Height, 6.2 mm.; diameter, 6.9 mm.

A larger specimen, differing slightly from the type, but apparently conspecific with it, shows 10 cinguli on the base and four on the whorl, with an additional very fine spiral lira developed by intercalation.

Clanculus eucarinatus sp. nov.

(Pl. iv, fig. 3)

Shell solid, depressed conoidal, falsely umbilicate. Protoconch small, of one-and-a-half flattened turns, smooth at the origin, gradually developing four spiral lirae which become granulose cinguli on the adult whorls. Adult whorls four, very slightly convex, bearing four cinguli, three of approximately equal size, the fourth immediately above the suture being more strongly developed and producing a distinct carination in the body whorl. Suture deeply canaliculate. Cinguli granulose, interstices axially lirate, three lirae corresponding generally to two granules on the cinguli. Periphery roundly carinate, base convex, with nine fine granulose cinguli with axially lirate interstices. Aperture oblique, tetragonal; outer lip thick, with two rows of denticles, the outer corresponding to the cinguli, the inner about six in number; columella oblique, reflexed, with a bifid tooth at the lower edge; umbilical cavity deep, narrow, dentate. Height, 5.2 mm.; diameter, 5.6 mm.

Genus **PHASIANOTROCHUS** Fischer 1885**Phasianotrochus laxegemmatu**s sp. nov.

(Pl. iv, fig. 4)

Shell small, acutely conical, falsely perforate. Protoconch of one-and-a-half convex turns; adult whorls five, flat, sculptured with a strong peripheral cord above the suture bearing numerous fine lirae and prominent, fairly widely-spaced tubercles, which are more prominent on the early whorls. Above the cord five equal spiral lirae, broader than interstices, crossed by numerous crowded axial lirae. Suture linear. Base convex with about 11 spiral lirae of unequal size faintly crossed by numerous radial striae. Periphery angulate. Aperture roundly quadrate, somewhat angularly produced in the outer lip, columella arcuate. Height, 4.6 mm.; diameter, 4.1 mm.

Phasianotrochus subsimplex sp. nov.

(Pl. iv, fig. 10)

Shell small, thin, conical, whorls evenly sloping, suture linear, impressed. Protoconch flattened, of two-and-a-half smooth, rounded turns, adult whorls five, sculptured with numerous, crowded, microscopic and sometimes obscure spiral striae, crossed by microscopic oblique axial growth striae. Periphery sharply angulate; base very slightly convex, with about 12 spiral striae, stronger than those on the whorl, and faint but definite oblique axials. Aperture quadrate, slightly produced and angled at the periphery. Columella somewhat curved, with a small tooth at the base. Height, 4.8 mm.; diameter, 3.7 mm.

Genus **CALTHALOTIA** Iredale 1929**Calthalotia nitidissima** sp. nov.

(Pl. iv, fig. 11)

Shell small, thin but solid, imperforate, almost perfectly conical with a slight impression above the suture on the evenly-sloping whorls. Protoconch small, of one-and-a-half turns, adult whorls five, with strong spiral ribs of approximately equal size, increasing from three in the first to seven in the body whorl; interspaces crossed by oblique axial lirae growing more numerous towards the last whorl. In the earlier whorls, an oblique cancellation between and granulation on the ribs is produced; on the last whorl the cancellation gives way to a strong and even granulation, the axials showing relatively fainter on the interspaces. Base convex, with nine narrow, slightly granulose spirals and numerous axials of growth. Aperture trapezate, produced in the outer lip, roundly angled at the

periphery, channelled within, following the exterior spiral ribs. Columella slightly curved, with a slight callus. Height, 6 mm.; diameter, 5 mm.

Calthalotia fictilis sp. nov.

(Pl. iv, fig. 14)

Shell small, fairly thin, conical, falsely perforate. Protoconch of one-and-a-half small, smooth turns; adult whorls four, evenly sloping, sculptured with fine, subequal spiral lirae, eight on the body whorl, reticulated by numerous fine, oblique axial lirae of about half the strength of the spirals. Base convex, with eight smooth spirals crossed by minute accremental striae, progressively weakening from the periphery to the umbilical fissure. Periphery angulate, aperture roundly quadrate, outer lip slightly effuse, columella arcuate, expanded at the umbilical fissure. Height, 4.0 mm.; diameter, 3.5 mm.

Observations—This species is slightly variable, particularly in the degree of prominence of the spirals above the suture. The two above the suture in some specimens are more prominent than the rest and produce a slight carination. The number of spirals varies with the size of the specimen. The holotype is, unfortunately, a young shell, larger specimens being broken at the tips. The diameter of a large example is 7.1 mm.

Genus LAETIFAUTOR Iredale 1929

Laetifautor obliquicancellatus sp. nov.

(Pl. iv, fig. 7)

Shell fairly small, conical, imperforate. Protoconch and earliest whorls missing, four remaining on the holotype. Aperture approximately one-quarter height of shell. Whorls flat, sloping towards the angular periphery. Sculpture varies on individuals, but consists in the holotype of five strong spiral lirae, increasing to seven on the body-whorl, two being less conspicuous than the others. These are crossed obliquely by equal-sized, strong, sharp axial ridges, producing a rhombic cancellation with deep interstitial pits; points of intersection developed into rounded granules. Base flat, with 10 basal spirals crossed by close, valid radial lirae producing granules nearly twice as frequent as those on the whorls. Columella slightly curved, with tooth at the base. Aperture subquadrate, broken. Height (estimated), 8 mm.; diameter, 6 mm.

Observations—Fragments of larger specimens reveal the regularity of the primary spiral lirae, though the secondary lirae may vary in number.

Laetifautor spinicarinatus sp. nov.

(Pl. iv, fig. 8)

Shell moderately small, fairly thin, broadly conical, imperforate. Protoconch (slightly damaged) of one-and-a-half turns; adult whorls four, slightly concave, anteriorly carinate. Sculpture of three strong spiral lirae on the posterior half of the whorl, two keels on the anterior half, each surmounted by two or three crowded lirae, those on the keel nearer the suture being of equal, those on the further of unequal strength; lirae of both anterior and posterior areas crossed by strong, sharp, oblique axial lirae producing a rhombic sculpture with deep, clearly defined interstitial pits; intersections with spinulose granules. Base flat, with eight strong spirals, faintly crossed and granulated by numerous radial lirae. Aperture rectangular on inner lip, acute-angled on outer lip which is produced into two ridges corresponding to the keels on the periphery. Columella almost straight, with tooth at base. Height, 5.5 mm.; diameter, 4.8 mm.

L. similaris Reeve, is very close to this fossil species.

LAETIFAUTOR sp.

This is a species closely related to *L. spinicarinatus*, but there is no specimen sufficiently complete for an accurate diagnosis to be made. The one shell that is almost complete shows sculptural features approximating very closely to the former from which it differs in that the anterior ribs on each whorl are less strongly developed and can scarcely be described as keels. They are, however, surmounted by lirae in the same manner, and it is probable that the species is merely an aberrant form of *spinicarinatus*.

Laetifautor crebrinodulosus sp. nov.

(Pl. iv, fig. 9)

Shell conical, fairly small, stout, imperforate. Protoconch very small, of one-and-a-half turns, faintly axially lirate; adult whorls six, slightly convex, sculptured with strong spirals, increasing by intercalation from three primary on the first whorl to four primary and three secondary on the body whorl. Spirals narrower than interspaces, crossed by evenly-spaced oblique axials, about 20 on the penultimate whorl, producing granules at the intersections and deep interstitial pits between. Base slightly convex, with seven spirals, equal in width to interspaces, crossed by numerous fine radials producing a faint granulation. Aperture subquadrate, columella oblique, outer lip produced, roughly crenulate within. Height, 7.9 mm.; diameter, 6 mm.

Observations—This species has features in common with *Calliostoma spinulosa*, Tate, *Calliostoma balcombensis* Chapple, and *Thalotia crigua* T. Woods, but is distinct from each.

Laetifautor bicarinatus sp. nov.

(Pl. iv, fig. 13)

Shell rather small, fairly stout, conical, higher than broad, falsely perforate. Protoconch very small, of one-and-a-half turns; adult whorls six, slightly convex in the early whorls, sculptured above the suture with a strong peripheral cord supporting in the body and penultimate whorls four beaded lirae, fewer in number in the early whorls; above this a narrow beaded cord and then four small, strong, beaded, equal lirae. In the early whorls oblique axial lirae are strongly marked, with beads at the junction of axials and spirals and deep interstitial pits between. These become obsolete in the penultimate and body whorls, the effect being that of simple granulation of the spirals. Base flat, with eight spiral lirae of approximately equal size with the interspaces. Aperture (broken) somewhat oblique, subquadrate, about one-quarter height of shell, columella straight. Height, 6.5 mm.; diameter, 4.8 mm.

These specimens are all small. The species is extremely close to *L. spinicarinatus* and is possibly conspecific with it. In general the sculpture of *bicarinatus* is more even, particularly on the keel, and there is a less rugged appearance about the shell generally. The keels are more strongly developed than in *spinicarinatus*.

LAETIFAUTOR sp. 2

Fragments of a large *Laetifautor*, the sculpture of which consists of a broad peripheral carina supporting several beaded threads; a narrower rib above this also surmounted by beaded lirae, and several small beaded lirae of varying size on the posterior portion of the whorl. Base flat, with about 16 spirals crossed and beaded by fine radials of growth.

LAETIFAUTOR sp. 3

Fragments of a large *Laetifautor* similar to the previous species, but differing in the unbeaded nature of the spirals on the whorls and in the smaller number of the basal spirals.

Genus *ASTELE* Swainson 1855***Astele fanaticum* sp. nov.**

(Pl. iv, fig. 6)

Shell depressed-conical, perforate; whorls somewhat concave, sloping. Protoconch small, slightly broken in the holotype, of two depressed rounded turns; adult whorls three, flattened beneath the suture in an almost horizontal narrow plane, then steeply sloping for the rest of the whorl. Periphery carinate. Sculpture of fine approximately equidistant spiral threads, four on the infra-sutural plane, nine on the sloping section of the whorl, 14 on the base of the body whorl. Interstices broader than lirae, crossed by crowded, very fine axial threads following the lines of growth. Base convex. Umbilicus deep. Aperture subovate; outer lip thin, angulate, following the peripheral carina. Height, 6.1 mm.; diameter, 7.0 mm.

Genus *PULCHRASTELE* Iredale 1929***Pulchrastele planiconicum* sp. nov.**

(Pl. iv, fig. 12)

Shell moderately small, conical, higher than broad, narrowly perforate, whorls evenly sloping, flattened. Protoconch small but prominent, of two turns; adult whorls six, sculptured above the suture with a strong peripheral cord which supports beaded lirae increasing in number to five on the body whorl; above the cord prominent lirae increasing by intercalation from three on the early whorls to five on the body whorl. Spirals crossed by numerous strong axial lirae producing a cancellation in the early whorls with granules on the spirals; the axials become relatively more frequent and less prominent in the last whorls and the cancellation develops into a mere granulation. Base flat, with 11 primary spiral lirae and one or two faint secondary lirae on the interspaces, somewhat granulose near the umbilicus, faintly crossed by numerous radial striae. Aperture broken, quadrate, produced in the outer lip and angled at the peripheral cord; outer lip thin; inner lip straight with a slight denticle at the base. Height, 8 mm.; diameter, 5.5 mm.

***Pulchrastele tuberculatum* sp. nov.**

(Pl. iv, fig. 15)

Shell small, broadly conical, narrowly umbilicate, stout, whorls evenly sloping. Protoconch slightly broken, very small, flattened, of one-and-a-half turns; adult whorls five, sculptured with a thick cord supporting four small tuberculate lirae at the sharply-angled periphery; above the cord three narrow spirals with small prominent tubercles on each whorl, about half as wide as the interspaces; number of tubercles on the periphery increases on each whorl, there being about 40 on the periphery of the body-whorl in the holotype. Aperture relatively small, rhombic, produced and sharply angled in the outer lip; inner lip damaged but showing a callus reflected towards the umbilicus. Base flat, with eight strong spirals, narrower than interspaces; umbilical spirals tuberculate. Height, 4.8 mm.; diameter, 4.5 mm.

Genus *ETHMINOLIA* Iredale 1924***Ethminolia perglobosa* sp. nov.**

(Pl. iv, fig. 5)

Shell solid, obtuse, globose conic, perforate. Protoconch somewhat flattened, turbinated, of three very small turns; adult whorls three, convex, sculptured with numerous fine spiral striae, crossed irregularly and frequently by faint, oblique striae of growth. Periphery rounded, base convex, sculptured with spiral striae as whorls, striae broadening somewhat and deepening near the umbilicus. Aperture subcircular, outer lip moderately thick, obscurely crenulate within;

inner lip areuate, with faint suggestion of tooth at base. Height, 4.6 mm.; diameter, 5.8 mm.

Observations—The sculpture of this species varies somewhat, some specimens presenting finer spiral striae than others. *Ethminolia probabilis* Iredale is the closest Recent species.

Fam. TUBIOLIDAE

Genus PARTUBIOLA Iredale 1936

Partubiola depressispira sp. nov.

(Pl. iv, fig. 16)

Shell very small, subdiscoidal, depressed, broadly umbilicate, tricarinate. Protoconch very small, slightly elevated, helicoid; adult whorls three, at first more or less rounded; body whorl with three regularly disposed carinae with flattened areas between; that between the suture and the carina below it decidedly sunken. Spiral sculpture of fine, more-or-less regular lirae, about six between each two keels; axial sculpture of indistinct growth lines on the spire faintly reticulating the spirals; axials much more prominent on the base, strongly reticulating the spirals in the umbilical area. Base flattened near the keel, convex towards the umbilicus. Umbilicus broad, showing all the whorls. Aperture wide, roundly quadrate, peristome not continuous; outer lip attached to whorl above at median carina, overhanging aperture above, excavate below. Height, 1.5 mm.; diameter, 3.5 mm.

Partubiola varilirata sp. nov.

(Pl. iv, fig. 17)

Shell very small, subdiscoidal, depressed, broadly umbilicate. Protoconch very small, of about two helicoid turns, elevated; adult whorls three, with one carina at the posterior one-third of the whorl. Area between suture and carina flat, depressed, sculptured about eight very fine spiral lirae; below the carina whorls convex, spiral lirae stronger and more widely separated. On the body-whorl about 12 subequal, strong lirae extend from the carina to the umbilicus, where they disappear; umbilical area with very faint spirals. Axials faint or absent in the region of strong spirals, finely reticulating the fine spirals below the suture and in the umbilicus. Umbilicus broad, showing all the whorls; aperture rounded, peristome not entire; outer lip overhanging above and excavate below. Height, 1.3 mm.; diameter, 3.5 mm.

Observations—This species is very like *P. blancha* Iredale, from which it differs in sculpture and size.

Fam. STOMATELLIDAE

Genus HERPETOPOMA Pilsbry 1889

Herpetopoma pliocenica sp. nov.

(Pl. iv, fig. 18)

Euchelus baccatus Chapman 1914 non Menke sp.; Chapman, Proc. Roy. Soc. Vict., 26, (2). (n.s.), 316.

Shell small, globose-conical, thin, perforate. Protoconch very small, of one-and-a-half flatly convex, axially lirate turns; adult whorls 4, convex, body whorl globose. Aperture about three-quarters as high as spire, suture deep, impressed. Sculpture of equidistant, granulose, spiral ribs, three on the post-embryonic whorl, increasing by intercalation to nine on the penultimate whorl; 13 on the body whorl extending evenly from the suture to the umbilicus. Interspaces wider than ribs, adorned with fine, regular, axial threads which are more distinct in the earlier whorls. Granules on the ribs correspond to threads on the interspaces. Periphery rounded. Aperture circular, entire; outer lip thin, crenate within; inner lip reflexed; columella rounded, smooth. Umbilicus narrow, deep. Height, 9 mm.; diameter, 7 mm.

Observations—This species is very like, and is probably ancestral to *H. baccata* (Menke); the sculpture of *H. pliocenica* is finer and the axial threads sharper and more clearly defined on most specimens. *H. pliocenica* is a smaller shell, less than half the size of the Recent *baccata*. A difference between the Pliocene species and the Recent was recognised by Chapman who states, "The Mallee example appears at first sight to have a neater and more concise ornament than fresh shells of the living species."

Fam. LIOTIIDAE

Genus DOLICROSSEA Iredale 1924

DOLICROSSEA LABIATA (Tenison Woods 1876)

Five small examples of this species occur; it is represented in the Barwonian as *D. sublabiata* (Tate). The Adelaidean specimens approximate more closely to the Recent *labiata* than to *sublabiata* and are smaller than either.

Superfam. NERITACEA

Fam. PHENACOLEPADIDAE

Genus PHENACOLEPAS Pilsbry 1891

Phenacolepas tela sp. nov.

(Pl. iv, fig. 19)

Shell moderately small, thin, oval, fairly low; apex prominent, slightly recurved, situated one-eighth distance from posterior border. Sculpture absent near apex, elsewhere of 80-90 radial ribs, with about 11 raised, sharp, concentric ridges, between which are very fine, crowded, inconspicuous, concentric lirae. Ridges crowded posterior to the apex, widely spaced anteriorly. Margin of shell raised slightly in the central portion, smooth; interior of shell smooth with faint irregular grooves corresponding to growth lines and radial ribs. Length, 7.5 mm.; breadth, 5.2 mm.; height, 2.5 mm.

Ord. PECTINIBRANCHIA

Subord. TAENIOGLOSSA

Section PLATYPODA

Superfam. RISSOACEA

Fam. RISSOIDAE

Genus **Kaurnella** nov.

Shell small, stout, imperforate, subglobose-conical. Apex paucispiral, smooth, small. Spire short, body whorl large; suture linear, whorls spirally lirate; aperture subcircular, entire. Genotype *Kaurnella denotata* sp. nov.

Kaurnella denotata sp. nov.

(Pl. v, fig. 1)

Shell small, fairly stout, subglobose-conical, imperforate. Spire small, body whorl large and globose. Protoconch of one-and-a-half very small, flatly convex, smooth, shining turns; adult whorls four, rapidly increasing, inflated; suture linear, deep. Whorls sculptured with numerous fine, spiral lirae, two of which are more prominent than the rest, crossed by inconspicuous, fine, oblique axial striae. Each whorl absolutely semi-ribbed, seven on the last whorl, producing a more-or-less obscure tuberculation on the prominent lirae. Base convex, lirate. Aperture subcircular; outer lip thickened; columella very slightly concave. Height, 3.1 mm.; diameter, 2.2 mm.

Superfam. CERITHIACEA

Fam. STRUTHIOLARIIDAE

Genus TYLOSPIRA Harris 1897

TYLOSPIRA CORONATA MARWICKI (Finlay 1931)

Pellicaria coronata Tate: Tate 1890, Trans. Roy. Soc. S. Aust., **13**, (2), 176; *marwicki* Finlay 1931, Trans. N.Z. Inst., **62**, (1), 17; *howchini* Cotton 1934, S.A. Nat., **16**, (1), 7; Howchin 1936, Trans. Roy. Soc. S. Aust., **60**, 19; *coronata* Tate subsp. *howchini* Cotton, Howchin 1935, Trans. Roy. Soc. S. Aust., **59**, 85, 90.

Tylospira coronata Tate: Dennant and Kitson, 1903, Rec. Geol. Surv. Vict., **1**, (2), 144.

Confusion appears to have arisen over the identification of this common and restricted Kalimnan species, probably on account of the few specimens examined by various authors. In the opinion of the writer the Adelaidean examples are merely geographical variants of *Tylospira coronata* as it occurs in Victoria. Examination of a large series of these shells—and they are extremely abundant—shows that the species is considerably variable between localities, those from the Adelaidean departing furthest from the type. The Adelaidean specimens, in general, show a weaker tendency to sulcation at the suture, but this, together with the height of the spire, is very variable in individuals from the same locality. Tate himself identified Adelaidean specimens with *coronata*. However, the writer acknowledges that differences occur, principally in the degree of sulcation and shape of the whorls, sufficiently general to permit the classification of the Adelaidean examples as a subspecies.

Finlay's name (no figure) has priority over Cotton's; the latter was evidently unfamiliar with the species and figured an extremely eroded shell. *Tylospira* is the correct genus.

Fam. CERITHIIDAE

Genus CLYPEOMORUS Jousseume 1888

Clypeomorus bivaricatus sp. nov.

(Pl. iv, fig. 20)

Shell moderately small, turreted, spire elongate. Protoconch of one-and-a-half small, inconspicuous turns, sharp at the origin; adult whorls nine, angulate at the posterior third, almost vertical in the anterior two-thirds; angulation more pronounced in the early whorls; body whorl more or less rounded, convex. Suture linear, impressed. Sculpture of curved axial costae, about 15 on the penultimate whorl, tuberculate at the angle, crossed by about six strong spiral lirae in the anterior two-thirds, and four much weaker, more closely-set lirae above the shoulder; the number of lirae increases slowly by intercalation from two on the earliest whorls. Two varices on each whorl, fairly prominent, one at the aperture. Sculpture finer on the base, about six fine spiral lirae extending from the columella. Aperture ovate, with a short, recurved anterior canal; outer lip thin, columella concave, inner lip with a thin callus. Height, 11 mm.; diameter, 3.1 mm.

Observations—The sculpture of this species is variable, its characteristics in general being that of tuberculate axial costae crossed by spiral lirae of unequal strength; angulation of the whorls is always present, at least in the early whorls.

Clypeomorus multiliratus sp. nov.

(Pl. iv, fig. 22)

Shell moderately small, turreted, spire elongate. Protoconch of three relatively large, convex whorls; adult whorls seven, convex, sculptured with promi-

ment curved axial costae, increasing from seven in the first adult whorl to 11 in the body whorl. Spiral sculpture of numerous fine lirae, wider than interspaces; about 15 on the penultimate whorl. Three varices of each whorl, only slightly more prominent than the costae. Sculpture on the base comparatively weak, about seven widely-spaced, faint spiral lirae being developed on an otherwise smooth surface. Aperture subovate, outer lip thin, broken in the holotype; canal short, slightly recurved; columella smooth, curved. Height, 9.7 mm.; diameter, 3.6 mm.

Genus **Adelacerithium** nov.

Shell small, elongate-turreted, spirally and axially ribbed. Apex prominent, paucispiral. Suture impressed, whorls flat. Columella with a strong twist or fold; aperture somewhat pyriform; outer lip not expanded, thin. Genus recalling *Ataxocerithium* but lacking pagodoid formation and possessing vertagoid columellar plait. Genotype *Adelacerithium merultum* sp. nov.

Adelacerithium merultum sp. nov.

(Pl. iv, fig. 23)

Shell fairly small, elongate-turreted. Tip of protoconch broken, one smooth convex whorl remaining; adult whorls 14, flattened; suture deep, impressed. Sculpture of fine, prominent, axial costae crossed by approximately equidistant spiral lirae, with a slight granulation at the intersections; about 24 axial costae on the penultimate whorl, with five spirals; the number of costae increases rapidly at about the seventh adult whorl; earlier whorls show a much coarser cancellation than the subsequent. Aperture broken in the holotype, subpyriform; columella short, with a strong plait; canal short, recurved. Height, 9.5 mm.; diameter, 2.2 mm.

Genus **Obtortio** Hedley 1899

Obtortio liratus sp. nov.

(Pl. iv, fig. 24)

Shell small, thin, elongate-turreted. Protoconch of one-and-a-half small, smooth turns; adult whorls seven, angulate at the posterior third, sculptured with fine, prominent, spiral lirae below the angle, absent or inconspicuous above; spirals crossed by about 14 curved, axial costae, more prominent in the early whorls and weakening considerably in the body whorl. Whorls varicate. Base spirally lirate, not so strongly as whorls. Aperture subovate, with a very short anterior canal. Height, 5.2 mm.; diameter, 1.7 mm.

Observations—The axial costae vary in intensity and in the degree of curvature or angulation. The angulation is modified in the holotype, but may be pronounced and the costae be somewhat tuberculate at the shoulder.

Genus **Cerithiopsis** Forbes and Hanley 1849

Cerithiopsis perelongatus sp. nov.

(Pl. iv, fig. 25)

Shell small, very elongate-turreted, whorls flattened. Protoconch of three carinate, smooth, tapering whorls; tip heterostrophic. Adult whorls eight, sculptured with three spiral costae of about equal size with the interspaces, crossed by about 16 axial costae, less conspicuous than the spirals and producing a flattened gemmulation on the spirals. Suture linear; base smooth. Aperture with outer lip broken, columella curved, with a short curved anterior canal. Height, 6.1 mm.; diameter, 1.1 mm.

Paratype—One specimen consists of the last whorls of a much larger shell, the height of which is estimated at 12 mm., the diameter 2.5 mm. The sculpture is consistent with that of the holotype.

Genus *TEREBRALIA* Swainson 1840***Terebralia fallax* sp. nov.**

(Pl. iv, fig. 21)

Shell elongate-turreted, of moderate size. Protoconch missing in the holotype; adult whorls 13, the first six convex and cancellate, the posterior half of the whorl more finely cancellate than the anterior; plications develop at about the sixth whorl and become increasingly prominent throughout the rest of the shell. Seven plications to each whorl narrow, curved, crossed by spiral sculpture; spiral sculpture commences in the post-embryonic whorls as fine, thread-like ribs, more prominent in the centre of the whorl and coarser in the anterior half; the ribs become wider and more nearly equal in size in the succeeding whorls; in the early whorls ribs are more or less rounded, in the latter whorls they are flattened and rectangular in section, interspaces correspondingly channelled with vertical sides; narrower than ribs. Each rib in the last whorl supports a fine median striation. Axial sculpture equal to the spiral in the post-embryonic whorls, obsolete in the last whorls. Base spirally lirate. Aperture and body whorl broken, columella concave; a short, slightly recurved anterior canal. Height, 31 mm.; diameter, 11.5 mm.

Paratype—A portion of a small shell has the protoconch intact, of two small globose turns, smooth and shining; succeeding whorls are convex and cancellate as in the holotype.

Observations—The sculpture and shape of this species are very like some forms of *Pyrazus ebeninus*, the common Sydney whelk, but the resemblance is superficial only. The species is not uncommon in the Bore, but no perfect specimen is available; the holotype is the most complete, fragments of two others are larger, about half the size of *Pyrazus ebeninus*.

Genus *MANULONA* nov.

Shell small, elongate-turreted; protoconch straight, paucispiral, smooth; suture linear; whorls flat, spirally sculptured; sculpture tuberculate; aperture sub-ovate; canal short, almost straight or only slightly reflexed; columella slightly arcuate. Genotype *Manulona arrugosa* sp. nov.

***Manulona arrugosa* sp. nov.**

(Pl. iv, fig. 26)

Shell small, slender, turreted; whorls flat to concave. Apex straight, of two smooth whorls; adult whorls 10, prominently sculptured with a supra-sutural thread above which is a prominent band with about 12 elevated tubercles; above the band, three flattened, beaded lirae, the beads being about twice as numerous as, and very much smaller than the tubercles; interspaces very narrow. Suture linear, irregular. Base striate, aperture sub-ovate, broken in the holotype, with a faint anterior canal. Height, 8.7 mm.; diameter, 2.2 mm.

***Manulona lirasuturalis* sp. nov.**

(Pl. iv, fig. 27)

Shell small, slender, turreted, whorls slightly carinate. Protoconch of two smooth, convex whorls; adult whorls 11. Whorls more or less smooth, faintly axially and spirally striate, with a row of about nine tubercles above the suture giving a carinate appearance to the whorls; below the suture an inconspicuous row of fine, numerous beads. Suture linear, with a single, fine lira imbricating above; the lira shows conspicuously on the periphery of the body whorl. Base spirally striate. Aperture broken in the holotype, columella curved. Height, 9.1 mm.; diameter, 2.2 mm.

Observations—This species is very similar to *M. arrugosa*, from which it differs in its sculpture. The aperture of specimens otherwise less complete than the holotype is shown as subquadrate, with a short anterior canal.

Fam. TRIPHORIIDAE

Genus TRIPHORA (s.l.) Blainville 1828

TRIPHORA (s.l.) spp

The only species of *Triphora* recorded from the Kalimnan is *T. wilkinsoni*, but it seems more than likely that several genera and species may be represented. Adelaidean examples, of which there are two species, do not seem to answer to the description of *wilkinsoni* T. Woods (Proc. Linn. Soc. N.S.W., 1878, 3, 233), although they belong to the same species as some from the Kalimnan. It is desirable to investigate further material, including authentic examples from the Barwonian, before identifying the present specimens in more than a broad sense.

Fam. DIALIDAE

Genus **Mereldia** nov.

Shell small, solid, subulate; apex paucispiral, smooth, dome-shaped; whorls numerous, flattened, striate; aperture relatively small, ovate; columella almost straight, short, smooth. Genus allied to *Diala*, differing in size, apex, and striation of whorls. Genotype *Mereldia incommoda* sp. nov.

Mereldia incommoda sp. nov.

(Pl. v, fig. 3)

Shell small, solid, subulate, whorls with straight sides. Protoconch of two flattened, dome-shaped, smooth, convex whorls; adult whorls nine, flattened, gradually tapering posteriorly; suture linear, impressed. Whorls shining but sculptured with numerous fine spiral striae. Aperture small, ovate; outer lip thin, simple; columella short, straight, smooth. Height, 10 mm.; diameter, 3.6 mm.

Superfam. AGLOSSA

Fam. PYRAMIDELLIDAE

Genus SYRNOLA A. Adams, 1860

Syrnola acrisecta sp. nov.

(Pl. v, fig. 2)

Shell very small, moderately tapering, thin, shining. Protoconch prominent, of two smooth, heterostrophic turns; adult whorls six, moderately rapidly increasing, flattened. Suture canaliculate, impressed. Sides of body whorl almost vertical, base convex, an obscure angulation at the periphery. Aperture elongate-pyriform, columellar fold near the origin, inner lip effuse, slightly expanded below. Height, 3.3 mm.; diameter, 1.1 mm.

Observations—This small species bears strong resemblances to *S. infrasulcata* and *S. jonesiana*; it is somewhat broader than either and is more deeply impressed at the suture.

Genus TURBONILLA Risso 1826

Turbonilla vixcostata sp. nov.

(Pl. v, fig. 6)

Shell elongate-turreted, solid, fairly thin. Protoconch of two prominent somewhat globose heterostrophic turns; adult whorls nine, slightly convex, slowly increasing; suture impressed and well defined. Axial costae about 14, from

suture to suture in the early whorls but becoming less conspicuous to the sixth whorl, from which they are obsolete for the rest of the shell; in the last three whorls costae give way to faint axial striae of growth; whorls also very obscurely striated spirally. Aperture subquadrate, elongate; columella almost straight, slightly plicate; outer lip thin. Height, 9·8 mm.; diameter, 2·2 mm.

(?) *TURBONILLA* sp.

Six specimens of a *Turbonilla*-like shell, all with the early whorls missing. There is no axial ribbing shown on any of the shells, though the most complete shows a suggestion of costae in its first whorl. The species is very like, though not identical with, *T. vircostata*; however, there is absence of ribbing, the shell is thicker and in the anterior quarter of each whorl there is a suggestion of angulation with a sudden oblique descent to the suture.

***Turbonilla subfusca* sp. nov.**

(Pl. v, fig. 7)

Shell very small, elongate-turreted, thin. Protoconch of two small heterostrophic turns, smooth and prominent; adult whorls seven, slightly convex, the first two of which are not or only obscurely costate. The costae rise towards the end of the second post-embryonic whorl and are almost fully developed in the third; in later whorls the costae are prominent, extending from suture to suture; about 16 costae on the penultimate whorl, slightly oblique and of approximately equal size with the interspaces. Suture impressed, deep. Aperture subquadrate; outer lip parallel to columella, with a downward turn at its junction with the previous whorl; aperture rounded anteriorly. Base without costae. Height, 5·1 mm.; diameter, 1·0 mm.

Observations—*T. subfusca* is somewhat like *T. radicans* Chapman and Crespin, but is a more fragile shell, with more numerous ribs. Its nearest resemblance is to the Recent *T. fusca* Adams, from which it differs in the sculpture of the early whorls, in the shape of the aperture and in possessing flatter whorls.

Fam. EULIMIDAE

Genus EULIMA Risso 1826

***Eulima longiconica* sp. nov.**

(Pl. v, fig. 4)

Shell small, shining, smooth, narrowly conical, very slightly curved. Protoconch of one inconspicuous flattened turn followed by eight adult whorls, nearly straight, slowly increasing. Suture linear, slightly impressed. Aperture ovate, outer lip entire; columella nearly straight, with a slight callus. Height, 5 mm.; diameter, 2 mm.

Observations—The nearest living species to this shell is *E. rogerae* Cotton and Godfrey.

***Eulima minuticonica* sp. nov.**

(Pl. v, fig. 5)

Shell minute, smooth, shining, subulate. Protoconch of two conspicuous, smooth, convex turns; adult whorls 7, straightly sloping; suture linear; body whorl with an obscure angulation. Aperture pyriform; columella slightly concave, reflexed. Height, 3·1 mm.; diameter, 1·0 mm.

Observations—Practically identical in shape with *E. longiconica*, distinguished by smaller size and number and shape of embryonic whorls.

Superfam. CHEILEACEA

Fam. CHEILEIDAE

Genus CHEILEA Modeer 1793

Cheilea adelaidensis sp. nov.

(Pl. v, fig. 8, 9)

Shell considerably broken, size and adult shape indeterminate, elevated; apex anterior, smooth and sharply curved in two turbinate whorls. Shell fairly smooth in the neighbourhood of the apex, central portion of the shell forming a cap with steep sides, rest of the shell apparently more or less flattened and irregular in shape. Sculpture of numerous, very fine, waving, radial lirae slightly wider than interspaces, broken by irregular, concentric lines of growth and crossed irregularly by diagonal radial grooves; sculpture extends from edge of smooth portion surrounding apex to the adult area outside the cap. Internal appendage fairly strong, broken in the holotype. Dimensions (of cap only)—height, 4 mm.; diameter, 6 mm.

Paratype—The internal appendage of the paratype is semi-circular in basal outline, convex in front, fairly wide and showing irregular growth lines.

Observations—Although neither of the two specimens is complete, it is desirable to describe this apparently rare and interesting shell. It differs markedly from either of the two Recent South Australian species, and like *C. occidua* Cotton forming a distinct cap in the early part of the shell, although the sculpture in no way resembles that of *occidua*.

Superfam. CYPRAEACEA

Fam. TRIVIIDAE

Genus ELLATRIVIA Iredale 1931

Ellatrivia wirrata sp. nov.

(Pl. v, fig. 16)

Shell small, thin, globular, narrowed anteriorly, spire conspicuous and globular. Surface of shell sculptured with fairly even, fine, sharp prominent ribs, most extending over the dorsal surface without interruption by medial line, others meeting at an angle in the medial dorsal region. About 35 ribs approach the outer lip over the dorsal surface, approximately 20 of which continue over the thickened, inflected outer lip and denticulate it within; about the same number denticulate the inner lip, extending across the columellar groove. Aperture arcuate, narrow, slightly widened anteriorly. Length, 9 mm.; breadth, 7 mm.; height, 6 mm.

Observations—*Ellatrivia merces* Iredale, the genotype, is very close to *E. wirrata* which is more globular, has a more prominent spire, and closer and finer ribs.

Superfam. DOLIACEA

Fam. CYMATIIDAE

Genus CYMATIELLA Iredale 1924

Cymatiella adelaidensis sp. nov.

(Pl. v, fig. 10)

Shell of moderate size, strong, elongate-fusiform, spire one-and-a-half times height of canal and aperture. Protoconch of three smooth, globose whorls, the first very small, the rest rapidly increasing; adult whorls six, with a strong varix every three-quarters of a revolution. Sculpture of prominent, narrow, elevated axial costae, the number varying from four to five on different whorls, between each varix; between the costae numerous irregular striae of growth; axial sculpture crossed by small, narrow, spiral ribs, wider than interspaces, irregular and unequal in size; faint nodulation where the spirals cross the axials. Aperture

subovate, with a fairly short, sharply recurved anterior canal; outer lip strongly variced, with elongate denticles more or less in pairs within; inner lip smooth, reflected over columella, faintly nodulose below; columella arcuate. Height, 15 mm.; diameter, 8 mm.

Observations—Two Pliocene species come close to *C. adelaidensis*, the Upper Aldingan *C. sevcostata* (Tate), which differs in the number of intervariceal costae and in the spiral sculpture, and *Personella clarkei* Chapman and Crespin, which has less prominent axial costae and is not so slender as the Adelaidean species.

Subord. **STENOGLOSSA**

Section RACHIGLOSSA

Superfam. MURICACEA

Fam. MURICIDAE

Genus MUREX Linné 1758

Murex peramangus sp. nov.

(Pl. v, fig. 24)

Shell of moderate size, triangularly ovate, imperforate, somewhat squat; spire half length of aperture and canal; body whorl large, with seven varices. Varices stout, prominent, squamose; sculpture of fairly fine, spiral lirae of unequal size, narrower than interspaces, crossed by frequent, finely-waving, axial lirae and foliaceous growth lamellae. Varices foliaceous below; umbilical depression conspicuous. Aperture ovate, outer lip variced; inner lip thickened, reflected over columella; columella arcuate; canal tubular, almost closed, recurved. Height, 33 mm.; diameter, 25 mm.

Observations—This species appears to be considerably variable in the strength of the spiral lirae and in the height of the spire, and to grade into *M. biconicus* Tate, which is a more elongated shell with a distinct sculpture. A graduated series from the 7-variced, squat *M. peramangus* to the elongate, 6-variced *M. biconicus* occurs in the Bore, but it is possible to separate the two species fairly easily. *M. biconicus* is a common species in the Adelaidean, though it is apparently rare elsewhere; so far as the writer is aware, the "Murray Desert" (type locality) is the only other locality at which it occurs.

Genus **Widningia** nov.

Shell moderate, elongate-fusiform, spire shorter than aperture; apex small, paucispiral; whorls convex, axially lamellose-costate, spirally lirate; sculpture squamose, resembling *Bedeva*. Aperture ovate, canal long, obliquely curved, columella without plait, otherwise shell resembles *Peristernia*. Unlike *Nodopelagia*. Genotype *Widningia crassiplicata* sp. nov.

Widningia crassiplicata sp. nov.

(Pl. v, fig. 25)

Shell of moderate size, fusiform, elongate, spire shorter than aperture and canal. Protoconch eroded, one small tooth turn remaining; adult whorls six, rapidly increasing, body whorl large. Six plicate axial costae on the body whorl, increasing gradually in number posteriorly; whorls completely and evenly sculptured with numerous spiral lirae which are more prominent on the anterior half of the whorl; these are crossed by crowded, squamose, waving, fine lamellae, the waves of which are regularly directed backwards over the lirae and forwards in the interspaces; lamellae slightly more prominent over the costae and becoming foliaceous, as do the plicate costae, towards the base. Shape of the whorls somewhat angulate from the prominence of the costae. Aperture elongate-ovate with a large canal; margin of aperture broken in the holotype; inner lip reflected over

columella. Height, 40 mm.; diameter, 17 mm; length of aperture, 12 mm.; length of canal, 11 mm.

Paratype—A specimen, more eroded than the holotype, with the aperture and canal complete. Outer lip with two rows of small, elongate, numerous denticles; canal recurved, half closed. Umbilical fissure wide in this specimen.

Superfam. BUCCINACEA

Fam. PYRENIDAE

Genus *Ademitrella* nov.

Shell small, elongate-fusiform, spire comparatively short, aperture long; protoconch smooth, subconical tip small, pointed, eccentric; whorls smooth, suture linear; columella smooth, outer lip of aperture thickened, subvaricose, smooth within. Genotype *Ademitrella insolentior* sp. nov.

Ademitrella insolentior sp. nov.

(Pl. v, fig. 11)

Shell small, spindle-shaped, with a comparatively short spire. Protoconch sharp, sub-conical, of one-and-a-half smooth turns, the apex eccentric; adult whorls three-and-a-half, smooth, flattened or slightly convex; body whorl large, compressed at the base. Whorls smooth except for faint, axial growth striae and about eight spiral striae on the base. Suture distinct, linear, ascending near the aperture. Aperture elongate, outer lip thickened, subvaricose, slightly excavate above, inflected below, smooth within; columella excavate a little above the middle, slightly twisted below and turned to the left. Height, 6.2 mm.; diameter, 2.1 mm.

Genus ZEMITRELLA Finlay 1926

Zemitrella muscula sp. nov.

(Pl. v, fig. 12)

Shell very small, bluntly fusiform, spire approximately equal to aperture. Protoconch of one blunt, flattened, smooth, convex turn; adult whorls four, flattened; body whorl moderately convex, tapering anteriorly. Suture canaliculate; whorls smooth except for indistinct axial growth lines and about 10 incised spiral striae at the base. Aperture elongate, fairly narrow; outer lip somewhat notched above and inflected below, conspicuously and finely dentate within; columella slightly excavate above, almost straight and turned to the left below. Height, 4.2 mm.; diameter, 2 mm.

Superfam. VOLUTACEA

Fam. MITRIDAE

Genus AUSTROMITRA Finlay 1926

Austromitra angusticostata sp. nov.

(Pl. v, fig. 13)

Shell small, rather thin, turreted. Protoconch of one-and-a-half small globosc, smooth turns; adult whorls five, convex, sculptured with strong, arcuate, axial ribs, narrower than interspaces, 11 on the penultimate whorl; interspaces very finely axially striate. Suture deep, impressed. Aperture elongate, narrowing anteriorly; outer lip broken but apparently smooth within; columella with four sharp, fairly stout plications; base strongly spirally lirate, six lirae on the holotype. Height, 8 mm.; diameter, 3 mm.

Observations—This species comes very close to *A. schomburgki* (Angas), but differs in having its axial ribs decidedly curved, and in the number of columellar plications. It is slightly more slender than *A. schomburgki*. In similar respects it is distinct from *A. scalariformis* (T. Woods).

Fam. TUDICLIDAE

Genus TUDICLA Bolten 1798

Tudicla sinotecta sp. nov.

(Pl. v, fig. 14)

Shell of moderate size. thin; spire conical, very short; body whorl large and elongate-conical. Protoconch very conspicuous of two prominent, convex turns, completely flattened at the top; adult whorls three, very rapidly increasing; whorls with slightly concave sides; body whorl concave posteriorly, rising at the periphery to a sharp angulation, slowly descending anteriorly. About 12 sharp angular ridges on the periphery becoming obsolete towards the edges of the whorl. These ridges are shown on the suture as even deep undulations imbricating the suture which is prominent and waving. Elsewhere sculpture of uneven, spiral ribs and threads crossed by irregular growth striae. Aperture elongate-ovate with a long canal; outer lip thin, broken; inner lip thickened; columella with a single twist, fold not prominent. Height, 23.5 mm.; diameter, 15 mm. Height of aperture and canal, 20 mm.

Fam. MARGINELLIDAE

Genus MARGINELLA Lamarck 1801

Marginella moana sp. nov.

(Pl. v, fig. 15)

Shell small, solid, pyriform, spire immersed, apical portion depressed. Body whorl completely enveloping the rest of the shell. Aperture long, narrow, curved, with margins parallel; aperture raised above the apex of the shell and curving somewhat towards the origin. Outer lip thickened, faintly and finely denticulate within; columella with four plaits, the anterior shorter than the rest and bordering the canal; canal narrow, curving inwards. Height of whorl, 4.1 mm.; height of aperture, 4.3 mm.; diameter, 3.1 mm.

Observations—This pear-shaped species comes closest to *M. globiformis* Chapman and Crespin, also occurring in the Abattoirs Bore.

MARGINELLA sp.

Shell small, stout, elongate-ovate, spire bluntly rounded, body whorl large, somewhat cylindrical. Protoconch roundly depressed, of one convex turn; adult whorls three, each almost covering the preceding whorl. Aperture nearly twice height of spire, elongate, narrow posteriorly and broadening anteriorly; outer lip constricted in the middle, with a row of fine denticles along almost the whole length; columella with four parallel plaits, one bordering the broad anterior canal.

The single specimens from the present bore being somewhat freakish, complete description of this species is deferred.

Superfam. TOXOGLOSSA

Fam. TURRIDAE

Genus BATHYTOMA Harris and Burrows 1891

Bathytoma adelaidensis sp. nov.

(Pl. v, fig. 17)

Shell of moderate size, broadly fusiform, solid, turreted. Protoconch of two fairly large, flatly globose, smooth whorls; adult whorls six, sculptured with two strong spiral cords close together on the shoulder; above the cords fine spiral ribs crossed by numerous, obliquely curved axial threads; below the cords one or two fine spiral ribs increasing in number on each whorl. On the body whorl, strongly costate from shoulder to base, about 10 prominent ribs approximately equal to the interspaces which bear from one to four fine spiral lirae. Spirals crossed by numerous fine growth lines showing a conspicuous sinus. Whorls carinate at the shoulder, concave above and below; suture linear. Aperture

oblique, elongate-pyriform, fairly narrow; outer lip slightly broken, with a sinus at the shoulder, canal short and slightly flexuous; columella somewhat oblique and concave; inner lip thin, smooth, reflected over columella. Height, 20 mm.; diameter, 8.5 mm.

Observations—Three specimens occur, apparently of the same species, with a narrower spire angle, the relative dimensions being 21 x 8 mm. The spiral sculpture is less prominent but otherwise resembles that of *B. adalaidensis* which is variable.

Genus *INQUISITOR* Hedley 1918

Inquisitor detritus sp. nov.

(Pl. v, fig. 18)

Shell small, narrowly fusiform. Protoconch of two somewhat flattened, convex, smooth turns; adult whorls six, slightly angled just above the middle of each whorl; suture impressed. Axial sculpture of about 11 prominent narrow costae to each whorl, extending from just above the angulation to the suture below, most prominent at the angle; spiral sculpture of one prominent rib immediately below the suture, followed by numerous, very fine, inconspicuous, crowded lirae to the angle, then by about five strong striae, crossing the axial ribs and the interspaces; on the body whorl the striae continue from the periphery to the base, about 16 in number. Aperture oblique, elongate, fairly narrow; outer lip broken in the holotype but obviously carrying a prominent sinus above the periphery; columella straight above, turned to the left below; inner lip smooth; canal almost straight, obliquely turned to the left. Height, 12 mm.; diameter, 3.8 mm.

Observations—This fossil species fairly closely resembles the Recent *I. flindersianus* Hedley, a larger shell lacking the rib beneath the suture. It appears to be not uncommon in the Kalinnan, part, though not all, of the examples identified with the New Zealand *I. wanganuiensis* (Hutton), belonging to this species. Adelaidean specimens are certainly not *wanganuiensis*.

Genus *AUSTRODRILLIA* Hedley 1918

Austrodrillia trucidata sp. nov.

(Pl. v, fig. 20)

Shell small, turreted, spire elongate. Protoconch smooth, of two flatly globose turns; adult whorls seven, gradually increasing, angulate at the middle. Sculpture of oblique axial costae, 12 on the penultimate whorl, sharp and prominent on the angle of the whorl and extending nearly to the suture below, absent above the angle, the post-angular area being more or less sharply excavate; numerous fine axial threads of growth; spiral sculpture absent except for about eight fine lines at the base. Aperture elongate-pyriform, about two-thirds height of spire, with a deep narrow sinus near the junction with the penultimate whorl; outer lip broken but fairly thick; columella straight above, slightly turned at the canal; inner lip callused over the columella and thickened into a tooth-like prominence near the sinus. Height, 15 mm.; diameter, 5 mm.; height of aperture and canal, 6 mm.

Austrodrillia decemcostata sp. nov.

(Pl. v, fig. 19)

Shell small, elongate-fusiform, moderately thick. Protoconch of one-and-a-half globose, smooth turns; adult whorls five, angulate at the middle in the early whorls, less so in the later. Sculpture of 10 axial costae on each whorl, more prominent in the middle but extending to the suture in each direction; whorls otherwise smooth except for very faint axial growth striae and six short spiral lirae adjacent to the canal in the body whorl. Suture impressed. Aperture oblique, fairly open; outer lip with a prominent sinus above and inflected below; columella almost vertical; anterior canal short, with a broad notch; inner lip smooth and slightly callused; callus near the sinus developed into a slight tubercle. Height, 7.2 mm.; diameter, 2.2 mm.; height of aperture, 2.2 mm.

Observations—A small species, very like *A. trucidata*; size distinct and costae extend front suture to suture, instead of being cut off above as in the former species.

Genus **Mappingia** nov.

Shell very small, elongate-subfusiform, near *Guraleus* in general appearance; apex multi-spiral; whorls convex, axially costate, spirally lirate; aperture pyriform, columella smooth; outer lip with a very shallow sinus, somewhat thickened and conspicuously dentate within. Genotype *Mappingia acutispira* sp. nov.

Mappingia acutispira sp. nov.

(Pl. v, fig. 21)

Shell very small, subfusiform, spire elongate. Protoconch of three elevated, convex, smooth turns; adult whorls four, convex, constricted at the suture which is irregular and impressed. Sculpture strong, of prominent, oblique slightly curved, plicate axial ribs, eight on the penultimate whorl, extending from suture to suture on the spire whorls and on the body whorl weakening from the periphery to the base where they disappear; axial sculpture crossed by fine, spiral lirae extending over the whole of the whorl including the base of the body whorl. Aperture narrow, elongate-pyriform; outer lip with a faint sinus at the suture; lip inflected below and conspicuously dentate within—about 10 small denticles altogether; columella almost vertical above, turned to the left and retroflect below; canal fairly long, narrow, deep, and slightly recurved; inner lip smooth. Height, 5.5 mm.; diameter, 2 mm.

Genus **ETREMA** Hedley 1918

Etrema peramoena sp. nov.

(Pl. v, fig. 23)

Shell very small, fusiform, with sharply carinate whorls. Protoconch of two large, erect, globose, smooth turns; adult whorls three, carinate at the middle. Above the carina sculpture of about six very fine spiral lirae crossed by curved, oblique axials, very fine but widely separated; spirals about three times as close as axials; on and below the carina sculpture of two fine spiral costae crossed by oblique axials producing a cancellation with sharp nodules at the intersections. Body whorl about equal to the spire, with coarse sculpture of the anterior half of each whorl continued to the base, the spirals becoming more numerous and crowded on the canal area, the axials growing fainter and disappearing. Aperture elongate-pyriform with a deep subquadrate sinus above the carina; outer lip slightly expanded below the carina, smooth within except for roughening by the spiral ribs; columella straight above, turned to the left below; canal very slightly curved. Height, 4.1 mm. diameter, 2.1 mm.

Genus **GURALEUS** Hedley 1918

Guraleus subnitidus sp. nov.

(Pl. v, fig. 22)

Shell very small, fusiform, spire gradate. Protoconch elevated, of three smooth, convex, flattened turns, the first very small; adult whorls four, roundly angulate just above the middle, deeply constricted at the suture; suture irregular, impressed. Axial sculpture of strong costae—10 on the penultimate whorl—strongest and most prominent at the angle; below the angle slightly oblique, in the narrow area above curved in the manner of the apertural sinus; costae weakening towards the sutures, fading out towards the base of the body whorl; spiral sculpture of numerous fine lirae (less strongly developed in the holotype than in most specimens, which vary considerably in the number and prominence of the spiral lirae); lirae stronger on the base in the holotype, about 12 in number. Aperture fairly narrow, sides subparallel, with a bluntly-rounded sinus below the

suture, constricted below to a short, open, slightly recurved canal; outer lip with sinus above, inflected below; columella slightly oblique, straight. Height, 4.8 mm.; diameter, 1.8 mm.

LIST OF SPECIES

GASTROPODA

**Haliotis naevosoides* McCoy 1876; *Tugali cicatricosa* Adams 1851, *infortunata*, sp. nov.; *Emarginula candida* Adams 1851, †*delicatissima* Chap. & Gab. 1923, **dennanti* Chap. and Gab. 1923; **Sophismalepas nigrita* (Sow. 1834); *Clanculus quadricingulatus*, *eucarinatus*, *Phasianotrochus laxgemmatus*, *subsimpler*. *Calthalotia nitidissima*, *fictilis*, *Lactifautor obliquicancellatus*, *spincarinatus*, *crebrinodulosus*, **bicarinatus* spp. nov.; *Lactifautor* spp. indet.; *Astele fanaticum*, **Pulchrastele planiconicum*, *tuberculatum*, *Ethminolia perglobosa* spp. nov.; **Solariella strigata* (T. Woods 1878); **Teinostoma depressula* Chap. & Gab. 1914; *Partubiola depressispira*, *varilirata*, **Herpetopoma pliocenica* spp. nov.; *Gena* sp.; **Liotella capitata* Hedley 1907; *Liotella* sp.; **Liotina lamellosa* (T. Woods 1876); **Dolicrossa labiata* (T. Woods 1876), cf. *Turbo* sp. (operculum), cf. *Astraea* sp.; **Astraea (Bellastraea) aster* (T. Woods 1878); **Phasiaella dennanti* Cresp. 1925; *Phasiaella* sp. (opercula); **Phenacolepas tela* sp. nov.; **Cocculina praecompressa* Chap. & Gab. 1923;

Kaurnella denotata sp. nov.; *Haurakia* cf. *novarensis* (Fraueud. 1867); *cf. *demessa* Tate & May 1900; *Merelina* cf. *suprasculpta* May 1915; **Epigrus chrysalidus* (Chap. and Gab. 1914), **cylindraceus* (T. Woods 1878); **Estea* cf. *bicolor* (Petterd 1884); *Rissoina elegantula* Angas 1880, *nivea* Adams 1851; **Turritella (Gazameda) acricula adelaidensis* C. & W. 1935; *subaricula* C. & W. 1935, **(Maoricolpus) murrayana subrudis* C. & W. 1935, sp. aff. *platyspira* T. Woods 1878, (*Ctenocolpus*) *trilix* C. & W. 1935; **Tylospira coronata marwicki* (Finlay 1931); *Siliquaria australis* Q. & G. 1934; **Neodiosoma provisi* (Tate 1893); **Zeacumantus diemenensis* (Q. & G. 1835); *Clypeomorus bicarinatus*, *multiliratus* spp. nov.; *Cacozeliana* cf. *granaria* (Kiener 1842); †*Ataxocerithium concatenatum* Tate 1893, cf. *Ataxocerithium* sp.; *Adelacerithium merulum* sp. nov.; cf. *Hypotrochus penetrinctus* C. 1932, cf. *Hypotrochus monachus* (Crosse and Fischer 1864), cf. *Hypotrochus* sp. indet.; *Obiorlio liratus* sp. nov.; *Semiveritagus capillatus* Tate 1893; *Terebralia fallax* sp. nov., *adelaidensis* How. & C. 1936, cf. *Cerithiopsis* sp.;

†*Trichotropis accrescens* Tate 1890; *Cerithiopsis perelongatus* sp. nov.; **Cerithiella trigemata* Chap. & Cresp. 1928; *Maniloua arrugosa*, *lirasuturalis* spp. nov.; *Seila (Notosella) crocea* Angas 1871; †*Triphora* spp.; *Mereldia incommoda* sp. nov.; **Architectonica wan-nonensis* (T. Woods 1878); *Epitonium* cf. *interstriatum* (Tate 1890); **Eglisia triplicata* (Tate 1890), sp. indet.; **Odostomia* cf. *deplexa* Tate & May 1900; *Syrnola bifasciata* T. Woods 1875, **tasmanica* T. Woods 1876, **tincta* Angas 1871, *infrasculcata* Tate 1898, *acrisecta* sp. nov., *Syrnola* sp.; **Turbonilla radicans* Chap. & Cresp. 1928, *subfusca* sp. nov., **liraecostata* T. Woods 1877, cf. *mariae* T. Woods 1876, *cf. *radicans* Chap. & Cresp. 1928, *rixcostata* sp. nov., (?) *Turbonilla* sp.; **Eulima longiconica*, *minuliconica* spp. nov., sp.; **Niso psila* T. Woods 1879; *Sabia conica* (Schum. 1817); †*Capulus circinatus* Tate 1893; †*Crepidula hainsworthi* Johnston 1885. **dubitabilis* Tate 1893, **inguiformis* Lamk. 1822; **Sigapatella crassa* (Tate 1893); *Chilea pliocenica* sp. nov.; **Polinices balteatellus* (Tate 1893), **substolidus* (Tate 1893), **subarians* (Tate 1893), ** (?) *huttoni* von Ihering 1907; **Sigaretotrema subinfundibula* (Tate 1893); **Natica hamiltonensis* Tate 1893, "Natica" sp. opercula, cf. *Ampullina* sp.; *Cypraea* sp. indet.; **Nototrivia* sp.; *Ellatrivia zorrata* sp. nov.; †*Proterato australis* (Tate 1890); **Hypocassis textilis* (Tate 1882); ***Semicassis transema* Tate 1889, ***radiata* Tate 1889; (?) *Cymatium* sp.

***Austrotroilon armatus* (Tate 1887), †*woodsii* (Tate 1879); *Cymatiella adelaidensis* sp. nov.; *Colubraria* sp.; *Widningia crassiplicata*, *Murex peramangus* spp. nov., ***Murex biconicus* Tate 1887, spp. indet.; †*Typhis laciniatus* Tate 1887, cf. *Fusinus* sp. indet.; †*Fusinus dictyolus* (Tate 1887); *Zenitrella menckana* (Reeve 1858), *lincolnensis* (Reeve 1859), *cf. *tayloriana* (Reeve 1859), *muscula* sp. nov.; *Adenitrella insolentior* sp. nov.; cf. *Zufra* sp.; *Cominella* sp. indet.; **Nassarius tatei* (T. Woods 1878); **Olivella nymphalis* (Tate 1889); ***Baryspira pseudaustralis* (Tate 1889), **tatei* (Marwk. 1924); *Astromitra schomburgki* (Angas 1878), *angusticostata* sp. nov., *scalariformis* (T. Woods 1876), sp.; *Mitra rhodia* (?) Reeve 1845, *glabra* Swain. 1821, *foedialis* Tate 1899; †*Austroharpa sulcosa* (Tate 1889); *Tudicula sinotecla* sp. nov.; ***Aulica tabulata* (Tate 1889); ***Voluta uncinifera* Tate 1889. **ellipsoidea* Tate 1889; †*Fulguraria ancilloides* (Tate 1889); **Oamaruia tatei* (Cossn. 1889); *Cancellaria* spp. indet.; †*Marginella kitsoni* Chap. 1922; **zenitworthi* T. Woods 1877, **globiformis* Chap. & Cresp. 1928, **muscaroides* Tate 1878, *tasmanica* T. Woods 1876, **kalimnae* Chap. & Cresp. 1933, sp. nov., *moana* sp. nov., spp. indet.; (?) *Asthenotoma subtilinea* Hedley 1918; **Filodrillia dilectoides* Chap. & Gab. 1916, cf. *Filodrillia* sp.; *Bathytoma* sp.; *adelaidensis* sp. nov.; **Inquisitor detritus*; **Austro-*

* Species (not necessarily subspecies) occurring in Kalimnan or Lower Pliocene.

† Species previously recorded only from Barwonian.

** Species occurring among "Murray Desert" fossils.

drilliæ decemcostata, **trucidata*, *Mappingia acutispira*; *Etrema peramoena* spp. nov.; †*Etrema præspurca* Chap. & Cresp. 1928; **Guraleus cf. tasmanicus* (T. Woods 1876), **subnitidus* sp. nov., sp.; **Comus hamiltonensis* Tate 1890; ***Terebra subspectabilis* Tate 1889, ***angulosa* Tate 1889, †*additoides* T. Woods 1877, sp.; †*Acteon scrobiculatus* T. Woods 1877, cf. *Acteon* sp.; **Semiaceton microplocus* Cossn. 1897; **Retusa longispira* (Cossn. 1897), **apiculata* Tate 1879; **Volvulella rostrata* (A. Adams 1850); **Cylichnella cuneopsis* (Cossn. 1897). *cf. *angustata* (Tate & Cossn. 1897); **Scaphander tatei* Cossn. 1897; **Roxania bullaeformis* Cossn. 1897.

SCAPHOPODA

Dentalium (Paradentalium) howchini Cott. & Ludb. 1938, **(Fissidentalium) bifrons* Tate 1887; †*Cadulus mucronatus* Tate 1887, **acuminatus* Tate 1887.

VERMES

**Ditrupa cornua wormbetsiensis* McCoy 1874.

ECHINODERMATA

* (?) *Goniocidaris mortensi* Chap. & Cud. 1934.

ARTHROPODA

**Balanus (Chirona) zelandicus* Withers 1924, **amphitrite acutus* Withers 1924.

PISCES

**Odontaspis contortidens* Ag. 1843; *Lamna* sp.; **Carcharias (Prionodon) aculeatus* (Davis 1888); **Myliobatis moorabbinensis* Chap. & Prit. 1907.

REFERENCES

- 1 CHAPMAN, F. 1916 Rec. Geol. Surv. Vict., 3, 4
- 2 CHAPMAN, F. 1914 Proc. Roy. Soc. Vict., 27, (1). (n.s.)
- 3 CHAPMAN, F., and CRESPIN, I. 1933 Proc. Roy. Soc. Vict., 46, (1), (n.s.)
- 4 CHAPMAN, F., and CRESPIN, I. 1935 Rep. A.N.Z.A.A.S., Melb. Meeting
- 5 CHAPMAN, F., CRESPIN, I., and KEBLE, R. A. 1928 Rec. Geol. Surv. Vict., 5, (I)
- 6 COTTON, B. C. 1934 S.A. Nat., 16, (I), 7
- 7 COTTON, B. C. 1935 Journ. Roy. Soc. W. Aust., 21, 153-4
- 8 COTTON, B. C., and GODFREY, F. K. 1938 Mal. Soc. S. Aust., 1
- 9 COTTON, B. C., and WOODS, N. II. 1935 Rec. S.A. Mus., 5, (3), 369-387
- 10 COTTON, B. C., and LUDBROOK, N. H. 1938 Trans. Roy. Soc. S. Aust., 62, (2), 217-228
- 11 DENNANT, J., and KITSON, A. E. 1903 Rec. Geol. Surv. Vict., 1, (2)
- 12 FINLAY, H. J. 1931 Trans. N.Z. Inst., 62, (I), 7-19
- 13 FINLAY, H. J. 1926 Trans. N.Z. Inst., 57
- 14 FINLAY, H. J., and MARWICK, J. 1940 Trans. Roy. Soc. N.Z., 70, (1), 77-135
- 15 FINLAY, H. J., and MARWICK, J. 1937 N.Z. Pall. Bull., 15
- 16 HALL, T. S., and PRITCHARD, G. B. 1902 Proc. Roy. Soc. Vict., 14, (1), (n.s.), 75-81
- 17 HEDLEY, C. 1922 Rec. Aust. Mus., 13, 213-359
- 18 HOWCHIN, W. 1935 Trans. Roy. Soc. S. Aust. 59, 68-102
- 19 HOWCHIN, W. 1936 *Ibid.*, 60, 1-34
- 20 HOWCHIN, W., and PARR, W. J. 1938 Trans. Roy. Soc. S. Aust., 62, (2), 287-317
- 21 LUDBROOK, N. H. 1937 Rep. A.N.Z.A.A.S., 23, Auckland Meeting
- 22 MARWICK, J. 1924 Trans. N.Z. Inst., 55, 545-579
- 23 MARWICK, J. 1923 Rep. A.N.Z.A.A.S., Wellington Meeting.
- 24 PARR, W. J. 1939 Min. & Geol. Journ. (Melb.), 1, (4), 65-71
- 25 SINGLETON, F. A. 1937 Rep. A.N.Z.A.A.S., 23, Auckland Meeting
- 26 SINGLETON, F. A. 1932 Proc. Roy. Soc. Vict., 44, (2), 289-308
- 27 SINGLETON, F. A., and WOODS, N. H. 1934 Proc. Roy. Soc. Vict., 46, (2), 207-213
- 28 TATE, R. 1890 Trans. Roy. Soc. S. Aust., 13, (2), 172-180
- 29 TATE, R. 1887 *Ibid.*, 10, 91-176

- 30 TATE, R. 1888 *Ibid.*, 11, 116-174
 31 TATE, R. 1890 *Ibid.*, 13, 185-235
 32 TATE, R. 1894 *Ibid.*, 17, 316-345
 33 TATE, R. 1899 *Ibid.*, 23, 102-110
 34 WOODS, N. H. 1931 Trans. Roy. Soc. S. Aust., 55, 147-151
 35 "The New Systematics" Ed. by Julian Huxley Oxford The Clarendon Press 1940

EXPLANATION OF PLATES IV AND V

PLATE IV

- 1 *Tugali infortunatum* sp. nov. Holotype, side and dorsal view, X 5
- 2 *Clanculus quadriceingulatus* sp. nov. Holotype, X 3½
- 3 *Clanculus eucarinatus* sp. nov. Holotype X 3½
- 4 *Phasianotrochus laxigematus* sp. nov. Holotype X 5
- 5 *Ethminolia perglobosa* sp. nov. Holotype X 5
- 6 *Astele fanaticum* sp. nov. Holotype X 3½
- 7 *Lactifautor obliquicancellatus* sp. nov. Holotype X 3½
- 8 *Lactifautor spinicarinatus* sp. nov. Holotype X 3½
- 9 *Lactifautor crebrinodulosus* sp. nov. Holotype X 3½
- 10 *Phasianotrochus subsimplex* sp. nov. Holotype X 5
- 11 *Calthalotia nitidissima* sp. nov. Holotype X 3½
- 12 *Pulchrastele planiconicum* sp. nov. Holotype X 3½
- 13 *Lactifautor bicarinatus* sp. nov. Holotype X 3½
- 14 *Calthalotia ficilis* sp. nov. Holotype X 5
- 15 *Pulchrastele tuberculatum* sp. nov. Holotype X 4
- 16 *Partubiola depressispira* sp. nov. Holotype X 5
- 17 *Partubiola varilirata* sp. nov. Holotype X 5
- 18 *Herpetopoma pliconica* sp. nov. Holotype X 3½
- 19 *Phenacolepas tela* sp. nov. Holotype, side and dorsal view, X 3½
- 20 *Clypeomorus bicarinatus* sp. nov. Holotype X 5
- 21 *Terebralia fallax* sp. nov. Holotype X 2
- 22 *Clypeomorus multiliratus* sp. nov. Holotype X 3½
- 23 *Adelacrithium merulum* sp. nov. Holotype X 3½
- 24 *Obortio liratus* sp. nov. Holotype X 5
- 25 *Cerithiopsis perelongatus* sp. nov. Holotype X 5
- 26 *Manulona arrugosa* sp. nov. Holotype X 5
- 27 *Manulona lirasuturalis* sp. nov. Holotype X 4

PLATE V

- 1 *Kaurnella denotata* sp. nov. Holotype X 6
- 2 *Syrnola acrisecta* sp. nov. Holotype X 6
- 3 *Mereldia incommoda* sp. nov. Holotype X 4
- 4 *Eulina longiconica* sp. nov. Holotype X 4
- 5 *Eulina minuticonica* sp. nov. Holotype X 5½
- 6 *Turbonilla vixcostata* sp. nov. Holotype X 4
- 7 *Turbonilla subfusca* sp. nov. Holotype X 4
- 8 *Cheilea adelaidensis* sp. nov. Holotype, exterior view, X 4
- 9 *Cheilea adelaidensis* sp. nov. Paratype, interior view, 4
- 10 *Cymaticella adelaidensis* sp. nov. Holotype X 2½
- 11 *Ademirella insolentior* sp. nov. Holotype X 4
- 12 *Zemitrella muscula* sp. nov. Holotype X 6
- 13 *Austromitra angusticostata* sp. nov. Holotype X 4
- 14 *Tudicla sinotecla* sp. nov. Holotype X 2
- 15 *Marginella moana* sp. nov. Holotype X 4
- 16 *Ellatrixia wirrata* sp. nov. Holotype X 3
- 17 *Bathytoma adelaidensis* sp. nov. Holotype X 2
- 18 *Inquisitor detritus* sp. nov. Holotype X 2½
- 19 *Austrodrillia decemcostata* sp. nov. Holotype X 3½
- 20 *Austrodrillia trucidata* sp. nov. Holotype X 2½
- 21 *Mappingia acutispira* sp. nov. Holotype X 7
- 22 *Guraleus subnitidus* sp. nov. Holotype X 6
- 23 *Etrama peramoena* sp. nov. Holotype X 6
- 24 *Murex peramangus* sp. nov. Holotype c. nat. size
- 25 *Widningia crassiplicata* sp. nov. Holotype c. nat. size